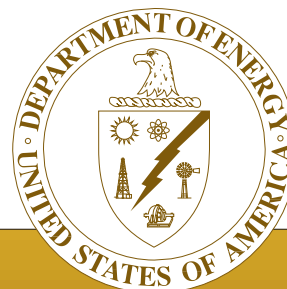*Independent Oversight
Review of the Status of*

DOE's Year 2000 Compliance

Management Report

July 1998

**Environment
Safety
Health
Safeguards
Security**

Office of Oversight

Office of Environment, Safety and Health

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Abbreviations Used in This Report

COTS	Commercial Off-the-Shelf (systems)
DOE	U.S. Department of Energy
HR	DOE Office of Human Resources and Administration
M&O	Management and Operating (contractor)
OMB	Office of Management and Budget
Y2K	Year 2000

OVERSIGHT

Executive Summary

The Department of Energy (DOE) Associate Deputy Secretary for Field Management, after consultation with the Deputy Secretary, requested that the Office of Oversight perform an independent review of the status of DOE's Year 2000 (Y2K) compliance encompassing three DOE operations offices. Based on Y2K status reports provided to the Office of Management and Budget (OMB) by DOE, the "report cards" issued by the Congressional Subcommittee on Government Management, Information, and Technology have assigned DOE failing grades and have been critical of DOE's progress and efforts. However, DOE's internal reports provide a different picture of the progress that is being made and projected. According to DOE internal reports, DOE sites expect almost all of their systems to meet the OMB deadline of March 31, 1999.

Although DOE was somewhat late in establishing and aggressively implementing a Y2K program and is "behind the curve" in the percentage of completed systems, DOE sites are generally meeting the OMB milestones. Although DOE sites plan to complete the vast majority of systems by the OMB deadline, the low grades will persist at least for the next reporting period unless DOE further accelerates its schedules and/or changes its reporting practices.

Despite the continued low grades, the Y2K projects that were reviewed are being effectively managed by the DOE operations offices and site contractors. In general, the field technical staff are competent, the approaches chosen are technically sound, and technical resources are reasonably allocated. Although there were startup delays, and guidance from the DOE Y2K Project Office has continued to evolve, DOE program offices are now actively supporting the field efforts.

The overall conclusion of this review is that DOE is well positioned to complete most of its mission-essential systems by the OMB deadline. DOE sites have generally been successful in addressing Y2K issues in the systems that have been completed to date, which generally have addressed relatively small and isolated systems. However, for some systems currently being repaired, deficiencies were evident in the technical approach, testing plans, evaluation of data interfaces, or processes for validating vendor certifications. Considering both the complexity of these systems and the quality of their technical approach, there is a moderate to significant risk that the repairs will be delayed or not sufficient to ensure that all Y2K issues have been adequately addressed.

While DOE is well positioned to make the deadline in most cases, continued attention and support are needed. There are a number of "bridges to cross" before DOE can have high assurance that it will meet OMB deadlines. For example, DOE sites will need to demonstrate that they can progress from the relatively small and straightforward projects that have been completed to large, complex projects that pose additional challenges. Four issues that merit increased attention and remedial actions at Headquarters and the field were identified:

- The rigor of testing is a concern.
- Data interfaces are a potential weak link in Y2K compliance.
- There is a lack of consistency in identifying mission-essential systems.
- DOE does not have a comprehensive understanding of the status of systems that are not mission-essential.

The Y2K status review conducted by the Office of Oversight identified six recommendations:

- Assess the technical quality of additional systems during the first quarter of fiscal year 1999.
- Improve reporting and focus management attention on complex, critical systems that face moderate to significant risk.
- Ensure that contingency plans are developed for appropriate systems.

- Take action to independently verify the Y2K testing process as test plans are finalized in accordance with the June 1998 deadline.
- Recognize and promote "best Y2K practices."
- Share commercial off-the-shelf (COTS) test results and lessons learned.

These potential enhancements are intended to be reviewed and evaluated by the responsible DOE and contractor managers, and prioritized and modified as appropriate in accordance with Y2K compliance objectives.

1.0 Introduction

As part of the government-wide effort to ensure readiness for the year 2000, the Department of Energy (DOE) established a Year 2000 (Y2K) project in May 1996. The Office of Management and Budget (OMB) has established a deadline of having all mission-essential systems Y2K compliant by March 31, 1999 (or otherwise having a contingency plan to ensure that Y2K problems will not impact essential mission activities).

The DOE Office of Human Resources and Administration (HR) is conducting Y2K programmatic reviews throughout the Department. The HR reviews that have been completed focused on programmatic compliance with key milestones and indicated mixed results as to progress across DOE. The June 2, 1998, status report by the Congressional Subcommittee on Government Management, Information, and Technology, issued by Chairman Stephen Horn, assigned DOE a grade of "F." As a result, the Associate Deputy Secretary for Field Management, after consultation with the Deputy Secretary, requested that the Office of Oversight perform this independent review of the status of DOE's Y2K compliance.

The purpose of the Office of Oversight review, conducted June 3-18, 1998, was to independently examine the status of Y2K compliance efforts. To this end, the review team gathered information on 40 mission-essential systems at sites reporting through the DOE Albuquerque, Richland, and Savannah River Operations Offices. The 40 systems evaluated represent approximately 25 percent of the total of 154 mission-essential systems that are being repaired by the sites and tracked by HR. For each of these systems, the review team examined the available Y2K documentation and conducted structured interviews with DOE managers, contractor managers, and technical staff with responsibilities for Y2K corrective actions.

The review encompassed both project management and technical aspects. The project management review of Y2K focused on: Y2K policy, guidance, and program management; roles, responsibilities, and accountability; personnel qualifications; project plans; and status reporting and feedback mechanisms.

The technical review addressed two categories of systems:

- **Systems Reported as Completed.** Ten of the systems reviewed had been reported by the sites as "completed," or fully compliant with Y2K requirements. For these systems, the review focused on whether DOE could have confidence that the systems effectively satisfy Y2K compliance requirements.

- **Systems Being Repaired.** The other 30 systems reviewed are still being repaired to meet Y2K requirements. For these systems, the review focused on whether DOE could have confidence that the site's technical efforts were adequate to meet the March 31, 1999, OMB deadline for compliance.

For both categories, the technical review of Y2K projects evaluated four elements: technical knowledge/approach, testing, interfaces, and vendor certification. Data were analyzed using expert technical judgment to arrive at consensus on evaluation of each element and the degree of confidence that DOE could have that the systems have been adequately addressed. The analysis considered both the technical approach and the characteristics/complexity of the systems within each project.

DOE's Reported Status

As reported in DOE's most recent report to OMB (May 15, 1998), DOE has identified 411 mission-essential systems: 149 are listed as complete, 143 as being replaced or retired, and 119 as being repaired. Using OMB's format, HR is tracking and reporting on the 154 systems that have been or are being repaired (119 that are being repaired, plus 35 that have been repaired and are now reported as completed).

The status reports provided to OMB by DOE and other Federal agencies are provided to the Congressional Subcommittee on Government Management, Information, and Technology. The Subcommittee processes the data and produces a quarterly "grade card" report (e.g., *Report Card - Year 2000 Progress for Federal Departments and Agencies - Overall Grade is F, June 2, 1998*). The grades, which range from A+ to F, are based on a projected date of completion, calculated from the average rate of progress over the past quarter.

The Subcommittee reports have assigned DOE failing grades and have been critical of DOE's progress and efforts. The most recent report states that only 44 percent of DOE's mission-essential systems will be compliant by the March 1999 deadline. Further, it specifically calls out DOE for poor performance, stating "To make bad worse, they [DOE] also have poor contingency plans, telecommunications systems, and embedded systems. If there was such a thing as F minus, DOE has earned it."

When compared to the Subcommittee report, DOE's internal reports provide a different picture of the progress that is being made and projected. According to DOE internal reports, DOE sites expect to meet the OMB deadline for all but six systems (five interrelated systems at Savannah River and one at Sandia National Laboratories). For each of the six systems, the sites have documented the reasons that they will not be complete by March 31, 1999, and have established plans that provide for completing the efforts by October 1999 (which was the original deadline established by OMB).

The results of this Oversight review confirmed that DOE was somewhat late in establishing and aggressively implementing a Y2K program. As a result of its slow start, DOE has not completed efforts to address Y2K issues with many of its mission-essential systems. Compared to other agencies, DOE is "behind the curve" in the percentage of completed systems.

Despite the failing grades, DOE sites are generally meeting the OMB milestones. Some are ahead of schedule now, others appear to be on schedule, and still others appear to be somewhat behind. The sites that are behind have generally recognized that they need to accelerate their efforts and have expressed their intent to do so.

Although the methods used by the Subcommittee provide a useful indicator of performance, there are a number of factors that make the "report card" a somewhat pessimistic picture of the actual status of DOE's Y2K progress:

- Most DOE sites are striving to adhere to the OMB milestones, which require systems to be completed by March 31, 1999. Because of the way the Subcommittee calculates grades, an agency will receive a low grade unless it completes a large fraction of systems before the deadline and demonstrates significant progress each quarter. A low grade can result even if every system at an agency is on schedule for meeting the OMB milestones.

- In several cases, DOE reports systems as an aggregate (sometimes referred to as a "rollup") of a number of related or interconnected systems. Reporting on these aggregated systems, rather than individual systems, might make it appear that the site is falling behind, because no system can be reported as complete until all of the systems in its aggregate group are complete.

- For some systems, most work is complete but sites are holding off reporting systems as completed until the OMB deadline in anticipation of additional tests or additional vendor upgrades. For example, a site may have completed upgrades and most of the tests on a system, but may have appropriately and conservatively chosen not to report completion until additional tests of the integrated system are performed; these tests may be delayed until the interfacing system is upgraded.

In short, DOE is generally meeting OMB milestones and plans to have completed the vast majority of systems by the OMB deadline. However, the low grades will persist at least for the next reporting period unless DOE further accelerates its schedules.

Y2K Project Management

Y2K Policy, Guidance, and Program Management: *Program management is generally effective and overall progress is on schedule, but the list of mission-essential systems needing Y2K-related repair may be incomplete.*

The DOE Y2K Project Office has helped address Y2K issues by promoting awareness of Y2K issues and concerns and establishing and administering the Department's Y2K status reporting mechanism. The Y2K efforts on the systems reviewed currently appear to have good support from site management and operating (M&O) contractors, DOE operations offices, and DOE program offices. Typically, site Y2K managers/coordinators provide frequent oral and written progress reports to their managers.

A significant startup deficiency involves the definition of "mission-essential." Although the Department's Y2K Project Office provided a definition of "mission-essential," the definition was evolving and did not include specific criteria or adequate guidance. As a result, each site used different criteria to identify their mission-essential systems. An examination of the types of systems designated as mission-essential

reveals wide differences in the sites' selection criteria. For example, "business related" systems (e.g., payroll, accounting) and/or communication systems (e.g., telephones, local area networks) are identified as mission-essential at some sites but not others. Further, there is a wide variation in the numbers of identified mission-essential systems from site to site (one site has 37 rollup systems, consisting of 442 subsystems, while other sites of similar size and complexity have as few as four).

Roles, Responsibilities, and Accountability: *After a slow start, the roles and responsibilities for Y2K efforts are now generally understood, and mechanisms for accountability are in place.*

Even though the importance of the Y2K project was not firmly established early in the process, DOE field office and site M&O contractor line management have made the system owners and technical personnel well aware of their responsibilities to meet established deadlines for achieving Y2K compliance. Individual performance evaluations for Y2K project personnel generally contain Y2K objectives. In addition, part of the corporate award fees for M&O contractors at many sites is contingent upon successful achievement of Y2K compliance. These mechanisms appear to be working effectively.

Personnel Qualifications: *Personnel at all levels of the Y2K efforts are well qualified for their duties.*

The individuals assigned to Y2K projects, whether at the Y2K manager/coordinator, system owner, or programmer level, appear to have a firm grasp of both the functional and technical aspects of the projects, as well as the consequences of potential Y2K failures. Technical staff were often selected because of their relevant skills, knowledge, and/or system responsibilities. They are well qualified to get the job done.

Project Plans: *The varying quality of project plans raises concerns about the ability to accurately track Y2K progress.*

Some project plans thoroughly addressed the appropriate project elements and contained detailed milestones, labor estimates, schedules, scope, constraints, and reporting requirements. However, some project plans contained few details or interim milestones. For example, some plans indicated that the systems would meet the major OMB Y2K milestones but lacked sufficient detail to provide a high level of confidence that the plans were realistic and achievable.

Status Reporting and Feedback Mechanisms: *Reporting requirements do not yield accurate information on the Department's progress.*

Even without detailed progress status reports, most Y2K managers were aware of the repair status of individual systems. At some sites, several individual systems are rolled into one for status reporting. Although this approach presumably facilitates reporting for the sites, it tends to disguise the Department's true progress. As discussed previously, the reporting system makes it difficult for senior Headquarters managers to identify and effectively respond to emerging problems.

Y2K Technical Results for Systems Reported as Completed

As of the May 1998 report to OMB, DOE reported that it had completed repairs on 35 mission-essential systems, of which the Office of Oversight reviewed 10. The results of the Oversight evaluation are shown in Figure 1. A brief explanation of the ratings is provided after the figure.

As shown in Figure 1, most of the ratings were good (green). Although some deficiencies were noted, none of the systems were identified as having significant weaknesses (red) for any of the criteria. Based on the sample, the systems for which repairs are complete are typically less complex than those still being repaired. They generally required minimal code renovation and relied heavily on commercial off-the-shelf (COTS) systems.

Technical Knowledge/Approach: The keys to successfully bringing a system into Y2K compliance are the competence of the staff assigned, their understanding of their Y2K problem, and the quality of the technical approach being implemented. All projects reported as completed were rated "good" in this area. The technical staff are well trained and have relevant experience, and they have selected appropriate Y2K solutions commensurate with project constraints.

Testing: In addition to the core system, tests must address interfaces, vendor-supplied COTS systems, and the hardware used in the computing environment. Most projects were rated "good" in this area. They tended to have well-proven testing methodologies (e.g., test beds and rollover dates) and comprehensive test scripts. Testing was performed at both the unit and integrated system level. Although the personnel interviewed provided convincing descriptions of the tests they had performed, several projects were noted to have "some deficiencies" because they had no formal test report available and/or had only limited documentation of test results.

Interfaces: Interfaces are of vital concern because a system cannot be Y2K compliant unless the data transfers across interfaces are compliant. Input data are especially critical since they are, in most cases, not under the direct control of the receiving system. Most projects were rated "good" in this area. They had identified and were effectively managing all of their interfaces. For the one system that was rated as having "some deficiencies," the project had not assessed all interfaces, had underestimated the importance of interfaces, and was not proactive in finding a solution.

Ratings
- ■ Good quality
- ■ Some deficiencies noted
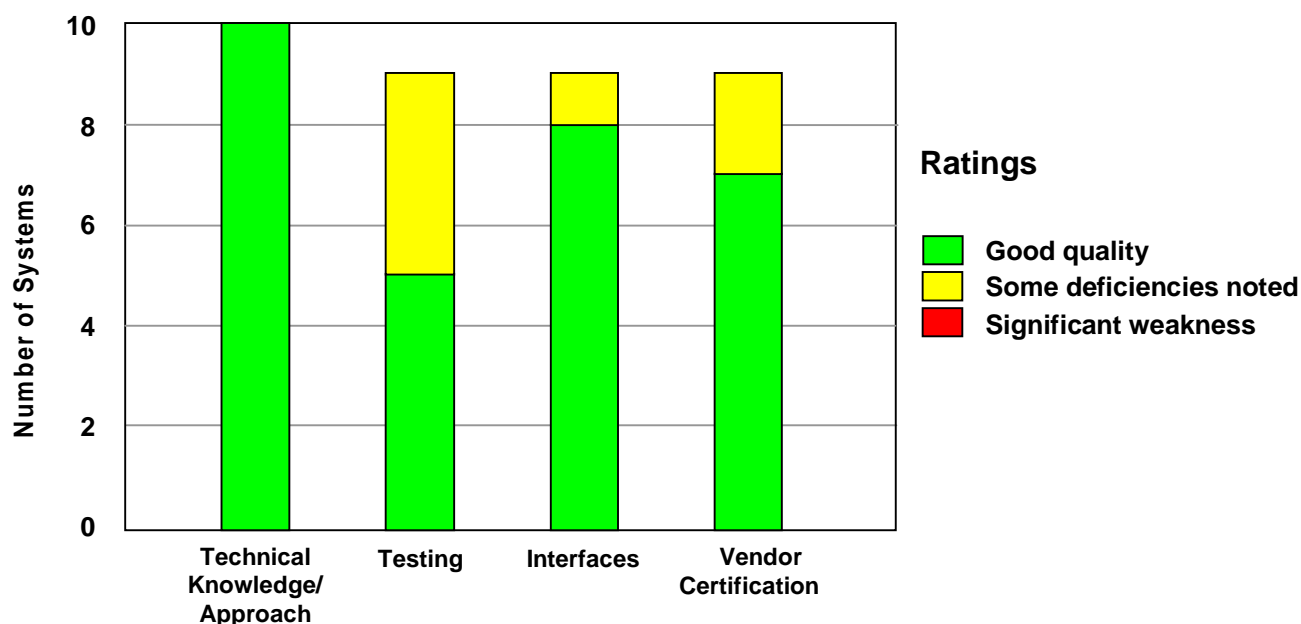- ■ Significant weakness

Figure 1. Results for Systems Reported as Completed

Vendor Certification: An important technical issue is whether the sites should verify vendors' claims of Y2K compliance and, if so, how much effort should be devoted to such verification. The sites have adopted a wide range of approaches, from accepting claims without testing to performing independent verification of every claim. Most projects were rated "good" in this area. They had followed all vendor instructions, removed or replaced non-compliant items, and/or performed independent verification. Several systems were noted to have "some deficiencies" because the projects placed too much reliance on vendor statements and had no plans for independent verification, or because the vendor had no Y2K upgrade solution.

Y2K Technical Results for Systems Being Repaired

The Office of Oversight reviewed 30 of DOE's 119 mission-essential systems still being repaired. The results of the Oversight evaluation are shown in Figure 2. A brief explanation of the ratings is provided after the figure.

As shown in Figure 2, most ratings were good (green). However, deficiencies were noted in a substantial number of the systems, and several systems had significant weaknesses (red) when evaluated against the criteria. Based on the sample, the systems that were evaluated typically incorporate numerous interfaces that, even when well understood, require demanding logistics for analysis and repair; contain legacy hardware and software for which there is no clearly-defined, commercially-available upgrade path;

or will require significant re-engineering to move to new platforms and implement new software in a new operating environment.

Technical Knowledge/Approach: Most projects were rated "good" in this area. They had the necessary specialized training and experience for the Y2K effort, had selected appropriate Y2K solutions commensurate with project constraints, and had good contingency plans. A few projects were noted to have "some deficiencies." These projects either lacked a clear upgrade path or were undertaking a large, complex software development effort to replace a legacy system.

Testing: Since test plans are not due until the end of June 1998 and validation is not due until February 1999, many projects have not yet prepared test plans or produced meaningful test results. Half of those that did have test plans were rated "good." These projects had well-proven testing methodologies, comprehensive test scripts, and plans for testing at both the unit and integrated system level. Several projects were noted to have "some deficiencies" because the system level testing that had been performed was incomplete. A "significant weakness" was assigned to projects that did not recognize the importance of a thorough test program.

Interfaces: The technical staff generally expressed a comprehensive understanding of their interfaces and how to manage them. Most projects were rated "good." These projects had identified and were effectively managing all of their interfaces. Several projects were noted to have "some deficiencies." These had either analyzed or tested their interfaces (but not both) or had date issues still pending.
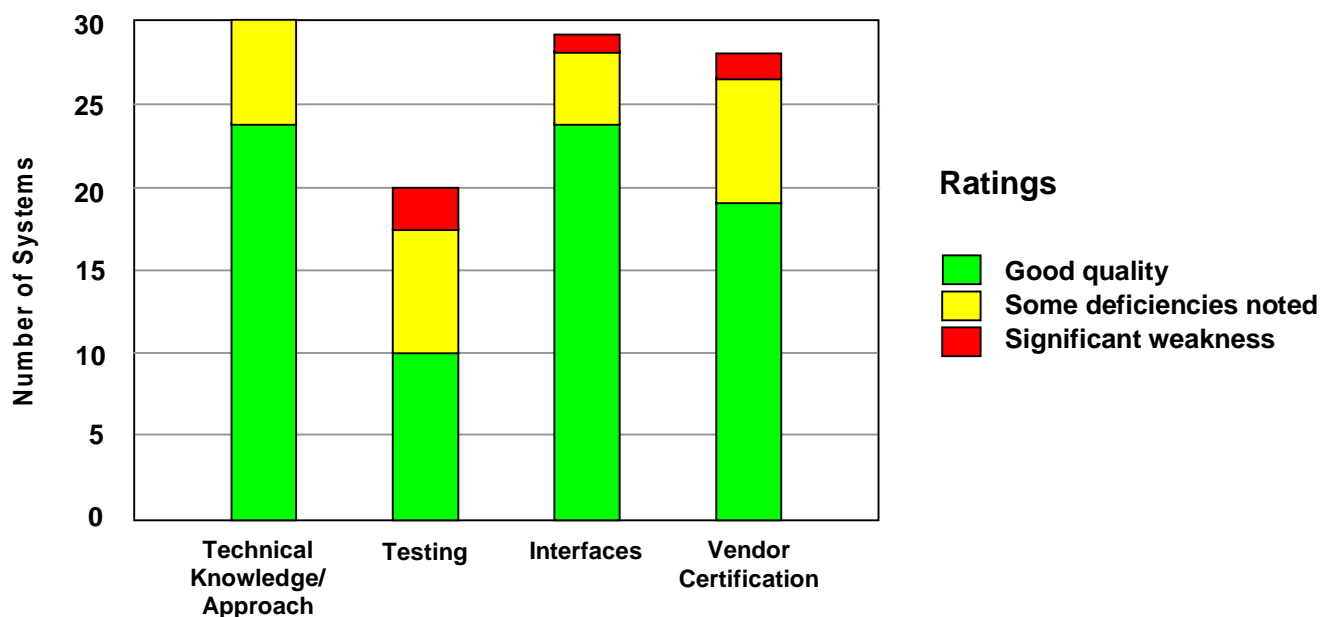

Figure 2. Results for Systems Being Repaired

One project that was planning to deal with failures after the fact and did not analyze data exchanges was assigned a "significant weakness."

Vendor Certification: Most projects are planning to perform verification tests on vendor-supplied systems only when system failure would significantly affect safety or security. Most projects were rated "good." They had followed all vendor instructions, removed or replaced non-compliant items, and/or performed independent verification. Several projects were noted to have "some deficiencies." For these projects, the vendor(s) had not yet provided Y2K compliance information; or the project had not considered the vendor's claims or certified their product; or the project was not proactive in finding a solution. Two projects were assigned a "significant weakness" because the vendors had not supplied a Y2K compliant upgrade and the vendor's claims had not been considered.

3.0 Conclusions and Issues for Attention

The overall conclusion of this review is that DOE is well positioned to complete most of its mission-essential systems by the OMB March 31, 1999, deadline. However, there are moderate to significant risks that repairs will be delayed or insufficient for approximately 20 percent of the systems currently being repaired.

In general, the systems that have been reported to be complete have been relatively small and isolated systems, were effectively addressed, and satisfy Y2K compliance requirements. The Office of Oversight did not identify any cases where systems reported to be complete had not been adequately addressed. Although Oversight noted some additional tests that might be prudent and some weaknesses in documentation, the noted deficiencies were generally easily corrected, and most sites indicated their intent to perform appropriate additional tests.

For the systems still being repaired, satisfactory progress is being made. Because the 30 systems reviewed are more complex and the quality of the applied technical approaches varies, the Office of Oversight concluded that, as they stand now, 80 percent of them are making good progress and likely to meet the OMB deadline for implementation in March 1999. For the remaining 20 percent, reasonable progress is being made but some deficiencies were evident in the technical approach, testing plans, evaluation of data interfaces, or processes to validate vendor certifications. Considering both the complexity of the systems and the quality of the upgrade project, there is a moderate to significant risk that the upgrades will be delayed or not sufficient to ensure that all Y2K issues have been adequately addressed.

A number of factors provide confidence that DOE sites can meet the OMB deadline and address identified weaknesses if management attention and support is sustained:

- The Y2K projects are being managed effectively by the DOE operations offices and site contractors. Most site project teams are well aware of what needs to be done and are optimistic that they will complete repairs on schedule. For the few systems that are not projected to meet the March 31, 1999, deadline, justifications have been provided, and the sites expect those systems to be completed by October 1999.

- The field technical staff are competent, the approaches chosen are technically sound, and technical resources are reasonably allocated.

- Although there were startup delays and Y2K Project Office guidance has continued to evolve, DOE program offices are now actively supporting the field efforts.

There are a number of "bridges to cross" before DOE can have high assurance that it will meet the deadline. Most notably, DOE has not completed many of the most challenging efforts (e.g., large, complex, and interconnected systems that have many interfaces and data exchanges). Most of the systems completed to

date are relatively simple projects, typically involving only a few technical staff working on stand-alone or "isolated" systems with few or no interfaces. To achieve a higher level of confidence, DOE sites will need to demonstrate that they can complete large complex projects effectively. They will also need to share the lessons learned with other sites.

Although not a major focus of this review, there are other reasons to be cautious about DOE's likelihood of success. For example, many Y2K efforts and planned corrective actions rely on factors that DOE cannot control, such as the issuance of vendor "patches" and/or upgraded versions of hardware and software. If vendors do not plan to ship such upgrades until after March 1999, or if the releases are delayed (as is common in the computer industry), DOE sites may not be able to complete their planned actions by the OMB deadline. Although this problem is not unique to DOE, DOE sites need to be aware of the potential for slippage and to identify systems that need contingency plans, particularly for certain types of equipment, such as telecommunications equipment (e.g., routers, switches), for which there are few alternatives except to wait on vendor upgrades.

In addition to the cautions above, the Office of Oversight identified four issues that merit increased attention and remedial actions at Headquarters and the field.

> **1. The rigor of testing is a concern.**

The success or failure of any Y2K project depends on the depth and breadth of the testing applied to it. The field has conducted few tests to date. Nearly all the test results were statements attesting to the fact that tests were done; very few documented test results were available. However, it is important to note that many projects are not far enough along to have produced meaningful test results. Some sites place too much reliance on vendors' statements of compliance without a careful analysis of the limitations and conditions stated by the vendor. Vendor certification is an important component of a Y2K program, but excessive reliance on vendors' statements can create a false sense of security. Vendor certification should not be accepted as a substitute for thorough testing.

> **2. Data interfaces are a potential weak link in Y2K compliance.**

Interfaces are of vital concern because a system cannot be Y2K compliant unless the data transfers across the interface are compliant. Most DOE sites are appropriately devoting a high level of attention to identifying and effectively managing their interfaces, both internal and external. However, data interface problems are perhaps the most complex to identify and difficult to test, and they require detailed technical knowledge and thorough test plans. For the completed systems examined in this review, many of the identified deficiencies involved testing of data interfaces.

> **3. There is a lack of consistency in identifying mission-essential systems.**

The process for identifying mission-essential systems varied widely from site to site and resulted in a disparate range of systems being identified as mission-essential. As a result, DOE's inventory of mission-essential systems does not reflect a clearly defined and consistent approach across DOE sites. For some systems identified as mission-essential, it is not clear that their failure would significantly impact DOE's ability to perform a critical mission; inclusion of these systems is not viewed as a concern because the systems should be fixed whether they are critical or not. A more important concern is that it is possible, and perhaps likely, that some systems that should be identified as mission-essential have not been identified as such because of the unclear guidance; such systems would not be tracked as part of the DOE-wide program (although they may be included in site-specific programs) and may not receive the needed degree of management attention.

> **4. DOE does not have a comprehensive understanding of the status of systems that are not mission-essential.**

There is a large Y2K infrastructure within DOE attempting to repair many more systems than the mission-essential systems tracked by HR. The 411 mission-essential systems identified by the Department represent only a fraction of those that need to be brought into Y2K compliance to avoid disruptions in work and impacts on costs and schedules. The field is making good progress on the mission-essential systems, but progress on the other systems has not been ascertained except at the local level, and to varying degrees. Recently, HR issued a request for similar Y2K progress to be reported on these additional systems.

Although some weaknesses in program management and implementation are evident, the field elements that were reviewed have the capability to accomplish the Y2K task and complete the upgrades by the OMB deadline if management attention and support are sustained.

Within this context, the Y2K status review conducted by the Office of Oversight identified six practical recommendations. These potential enhancements are not intended to be prescriptive. Rather, they are intended to be reviewed and evaluated by the responsible DOE and contractor managers, and prioritized and modified as appropriate in accordance with overall Y2K compliance objectives.

> **1. Assess the technical quality of additional systems during the first quarter of fiscal year 1999.**

This Oversight review examined 40 of 154 mission-essential systems currently being tracked by HR, encompassing three operations offices. The Office of Oversight (or another organization with appropriate technical capabilities) should be directed to review the status of the other operations offices and other mission-essential systems. (Currently there are 114 others, but the number can change as other mission-essential systems are added or deleted from the list, for various legitimate reasons). Such a review should be completed in the first quarter of fiscal year 1999, when most testing will be under way. As appropriate, consideration should be given to including other elements in such a review (e.g., embedded systems).

> **2. Improve reporting and focus management attention on complex, critical systems that face moderate to significant risk.**

Management must focus their attention on a system-by-system basis, concentrating on those systems that present the greatest risk of not being completed before the OMB deadline or that represent the most severe consequences (e.g., potential for impacting facility or worker safety or national security). To be able to identify these systems on a real-time basis, the current status reporting system will have to be improved. This may also require a more rigorous planning and scheduling system for monitoring and reporting progress at the individual project level. In addition, reporting practices at some sites (e.g., reporting aggregates instead of individual systems) need to be evaluated in light of the fact that they can result in overly conservative progress reports to OMB and contribute to low grades on the Congressional report card.

> **3. Ensure that contingency plans are developed for appropriate systems.**

Despite the best efforts of technically competent people, nearly all systems run at least some risk of a Y2K problem (e.g., an interface can be overlooked, and massive modifications to software often introduce "bugs"). To avoid most problems, Y2K projects must conduct comprehensive tests and manage their interfaces effectively. However, it would be prudent for the sites to prepare Y2K workaround plans (i.e., joint disaster recovery and contingency plans) for dealing with the inevitable problems when they do occur. Current OMB guidance requires contingency plans only if major milestones for validation and/or implementation are missed. Consideration should be given to requiring workaround plans, describing the continuing operations and recovery process to be implemented if a Y2K failure occurs, for DOE mission-essential systems in those cases where the consequences of a failure are particularly severe or the risk of a Y2K problem is moderate to significant (e.g., for particularly complex systems or systems that have experienced technical difficulties).

> **4. Take action to independently verify the Y2K testing process as testing plans are finalized in accordance with the June 1998 deadline.**

A sample of the test plans that are now being prepared should be carefully reviewed. Once testing begins in earnest, actual Y2K tests of the most critical systems should be observed and analyzed. These independent verifications should ensure that tests of the data exchange across all system interfaces are included and that vendors' claims of Y2K certification are being appropriately addressed.

> **5. Recognize and promote "best Y2K practices."**

"Best Y2K practices" that have been identified within DOE's Y2K efforts, such as the use of "mirror-image" test beds for production systems, should be recognized and shared across the complex. DOE should also adopt applicable best practices from the private sector, such as fixing legacy Y2K problems before implementing system migrations or enhancing system functions, and scheduling interoperability testing of individually-repaired systems.

> **6. Share COTS test results and lessons learned.**

To make more effective use of its Y2K resources, DOE needs to take a more aggressive approach to sharing COTS test results and Y2K lessons learned across the complex. A centralized, comprehensive, electronic clearinghouse for automatically disseminating Y2K defect information and lessons learned to subscribers throughout the complex should be developed and implemented. This would eliminate unnecessary, redundant testing.